Australian Government
Department of Defence
Defence Science and
Technology Organisation

Future Logistics Information Environment Best Practices: IBM Business Integration Modeler Advanced Edition

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DSTO-TN-0678

ABSTRACT

IBM Business Integration Modeler Advanced Edition allows Future Logistics Information Environment task members to map business processes around existing systems and has been used to map processes surrounding the Movement Management System. During this mapping process a number of lessons were identified and to ensure that these are captured this document has been developed with a series of best practices and recommendation so that these lessons are learnt and future FLIE task members do not suffer the same issues. Although many of the recommendation and practices are tailored to the FLIE task requirements other projects will also benefit.

Published by

DSTO Defence Science and Technology Organisation
PO Box 1500
Edinburgh South Australia 5111 Australia

Telephone: (08) 8259 5555
Fax: (08) 8259 6567

AR-013-580
November 2005

APPROVED FOR PUBLIC RELEASE

Future Logistics Information Environment Best Practices:
IBM Business Integration Modeler Advanced Edition

Executive Summary

During the mapping of the JP2030 Movement Management System (MMS) business processes using the IBM Business Integration Modeler Advanced edition a number of problems were identified and solutions found. To ensure that other Future Logistics Information Environment (FLIE) task members do not encounter these problems again a series of recommendations and practices have been captured herein.

These recommendations and practices should be followed by FLIE task members as they ensure that models produced are consistent and relate to one another. Other projects will also benefit as a number of workarounds are documented herein that overcome some processing requirements that require unique process structures.

This document will be updated over time so please refer to the DSTO FLIE Sharepoint task site (http://c2d-teams.dsto.defence.gov.au/task/04-072/) for an updated version of this document. If you have additional recommendations, best practices or lessons in the use of Business Modeler please contact Egon Kuster (FLIE Task Manager, Command and Control Division, egon.kuster@dsto.defence.gov.au).

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Summary of Recommendations

Acronyms

Acronym	Description
ADO	Australian Defence Organisation
BPEL	Business Process Execution Language
CVS	Concurrent Versions System
FTP	File Transfer Protocol
FLIE	Future Logistics Information Environment
MMS	Movement Management System

Glossary

Term	Description
Annotation	Element used to describe other elements.
Artifact	A component within a project, such as a resource or a business item.
Broadcaster	An element used in conjunction with a Receiver, linked together with a Notification. Designed to broadcast a signal to one or more receivers, where the process resumes.
Business Item	A physical item used in a business process (e.g. an requisition order).
Business Modeler	IBM application used to model business processes.
Business Process	Process undertaken in a business environment.
Concurrent Processing	Multiple tasks executing at the same time.
Connection	Used to connect tasks together.
Element	An item in a process model.
End node	Signifies where processing stops.
Expression	Used to define rules, constraints and preconditions. Expressions are conditions or mathematical functions that can be evaluated.
Expression Builder	The tool used in Business Modeler to create an expression.
FLIECVS Repository	The FLIE tasks CVS repository. This is where all Business Modeler workspaces are stored for the FLIE task.
Flowchart	A diagrammatical representation of information, processing or data flow.
General practice	A general practice that does not relate to the FLIE environment by may be applied to most projects.
Global Task	A task that is global to the project. Global task can be reused in multiple process diagrams.
Join	Element used to join two concurrent connections into a single output. Joins wait for all inputs before executing and merging the input data.
Local Process	A process that aggregates detailed subtasks. Used for easier visibility of large processes.
Local Task	A task which is only visible within the process model it was created in.
Merge	Element used to merge two connections into a single output. A merge executes as soon as the first input arrives.
Notification	Element used in conjunction with a Broadcaster and Receiver. The Notification is the link between these two elements and contains details about the content of the notification.
Observer	Element that stops process flow until a defined condition is met.
Process	A sequence followed to complete an action or meet a goal.

Process Model	A diagrammatical view of a business process.
Project	Where multiple related Processes, Elements and Artifacts co-exist.
Project Tree	Displays all components in the current workspace, such as Resources, Organisations etc.
Project Tree Filter	Filters out certain components of a project in the project tree, such as Resources, Organisations etc.
Receiver	Element used in conjunction with a Broadcaster, linked with a Notification. Receives a Notification sent from a Broadcaster and is where the process resumes.
Repository	Element that holds multiple business items that a process accesses at any given time. Can be local or global.
Resource	What tasks use to operate.
Sequence of Execution	The execution or flow of a process model.
Start node	Signifies where a process is to start.
Stop node	Signifies where a process is to stop.
Task	Element that represents an activity (e.g. 'Process order').
Task specific practice	FLIE related practice to help administer and understand process models developed for FLIE.
Workspace	The location that project exists in. A workspace can have multiple projects.
Process Simulation	A simulation of a process model. Used to test out a process and verify that it is correct or produce metrics.
Simulation Snapshot	An instance of the process model and its artifacts at a point in time during a simulation execution.
Attribute	Field in an Artifact that describes itself, such as a business item.

1. Introduction

This document outlines the best practices, in the form of recommendations, for using IBM WebSphere Business Integration Modeler Advanced Edition (Business Modeler) software, version 5.1.1.2. Members of the DSTO Future Logistics Information Environment (FLIE) task developed these best practices and recommendations during the analysis of the Australian Defence Organisation (ADO) Movement Management System (MMS) logistic systems. While primarily written to support existing FLIE task members, this document is also designed to help new users of Business Modeler. It is expected that FLIE members will adhere to these recommendations when using Business Modeler. This document concentrates only on using the Business Modeler tool, if you are interested in the products produced or the analysis process applied then refer to the "Future Logistics Information Environment: Movement Planning Process" document [1].

Business Modeler is a complex tool that allows users to analyse business processes within the business environment. While still making use of basic flowchart structures such as decisions, processes and repositories, Business Modeler adds functionality by introducing elements such as receivers, broadcasters, joins, merges, observers and others. These new concepts allow for advanced business process modeling.

Business process models can be viewed at two levels within Business Modeler, either at the general business level or the more advanced technical level. At the advanced level users can start to edit more complex attributes of the business process including assigning expressions to decisions and observers, simulating processes to calculate net costs, timing, and so on. Splitting the tool into two views allows for a basic business process to be captured at the general basic level and then later assign more complexity and details allowing for the process to be executed, simulated and inserted into an operational environment. Therefore this tool helps bridge the gap between simply documenting the process and actually executing processes within the enterprise system.

2. Best Practices

The best practices and recommendations presented below are divided into those specific to the FLIE task (section 2.1) and those likely to be generally useful to all Business Modeler users (section 2.2).

2.1 Task Specific Practices

The practices described herein are specific procedures to be undertaken in order to properly administer a Business Modeler project in the FLIE team environment. However, these practices are most likely applicable to other team environments.

2.1.1 Study Workshop Documentation and Examples

There is a "Quickstart Guide"[2] which provides a basic overview of Business Modeler's capabilities. The examples from the tutorials[3] and "Quickstart Guide" should take a maximum of one day to read and complete. These tutorials can also be found in the Business Modeler help by accessing the "Information Center" and selecting '`Getting Started -> Tutorials`' (see Figure 1).

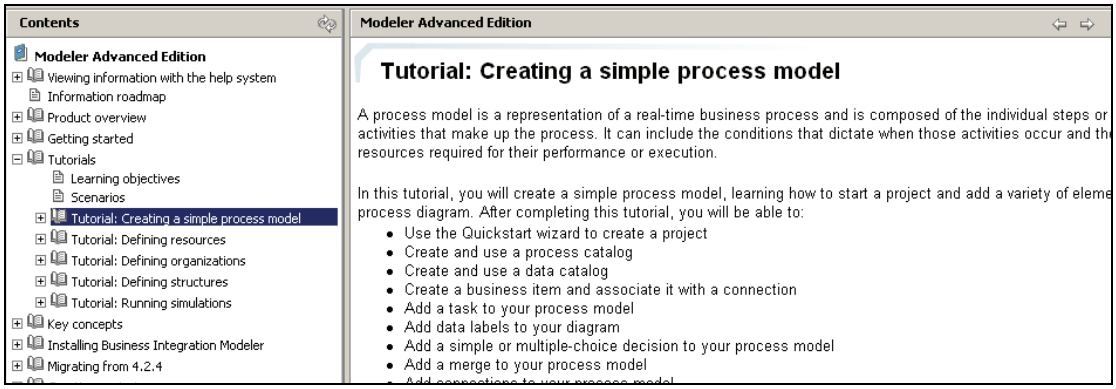

Figure 1. Tutorials in Business Modeler help

The five tutorials are:

- Creating a simple process model,
- Defining resources,
- Defining organizations,
- Defining structures,
- Running simulations.

Recommendation 1.	Complete the tutorials before undertaking your first project.

2.1.2 Creating Workspaces

Each workspace should contain only a single project, and hence the business processes of a single logistics system. This helps avoid confusion when amending a project and facilitates the exchange of workspace with other users. Workspaces can be zipped and

shared with users who can unzip a workspace and use it straight away without additional configuration. This approach is also advantageous when creating backups of workspaces, which is described in section 2.1.3 later.

NOTE: Business Modeler does have the capability to handle multiple projects in a single workspace but by using multiple workspaces allows for easy management of activities.

Recommendation 2.	Workspaces should be used to manage activities.
Recommendation 3.	Each workspace should contain only one project.

2.1.3 Backing up

The workspaces need to be backed up every time a significant change is made to the model. This is because Business Modeler can occasionally crash and corrupts open workspaces[1]. The process for backing up is:

1. Compress the workspace by using Zip (or other compression program). Save the file as "`model_DDMMMYY.zip`" e.g. "`model_01JUN05.zip`". In the event where there are two changes in a single day, follow the date with an underscore and a numeric value e.g. "`model_01JUN05_01.zip`".
2. Upload the file to the archive location (eg. File Transfer Protocol (FTP) Server, Windows Share, Microsoft Sharepoint or other common file storage system).

Following this process keeps the most current version of the workspace available to all team members.

NOTE: At the time of writing the Concurrent Versions System (CVS) function within Business Modeler was not working and an alternate method was required and is described above. Ideally the built-in CVS capabilities of Ellipse[2] would be used to save incremental versions of the models. It is possible to use a standard instance of Eclipse or an alternate CVS client to upload and maintain a CVS repository of the model as many of model's files are just simple XML or text files, which synchronise well with CVS repositories. Please follow the CVS client's instructions to upload and maintain the model in the repository.

Recommendation 4.	Back up the workspace every time a significant change is made to the project.

[1] This problem will most likely be corrected in future versions of Business Modeler.
[2] IBM Business Modeler is built upon the Eclipse Platform and can use the standard Eclipse functions like CVS.

2.1.4 Use Advanced Mode

Within Business Modeler, there are three user modes: basic, intermediate or advanced mode. For all models developed under the FLIE task, advanced mode is recommended as it allows the most flexibility when developing the process model, and shows all possible features that basic and intermediate modes hide. This allows the greatest amount of information to be captured about the model, which will allow quicker migration to execution engines when implementing the completed models.

Recommendation 5.	Use the 'advanced' mode when creating or amending a project.

2.1.5 Annotations

For the final process model release, annotations should be appended to all elements. As annotations are a nuisance during development, it is recommended that these are only added once the process model is complete. Refer to Figure 2 for an example process displaying an annotation.

Recommendation 6.	Add annotations once a majority of development is complete.

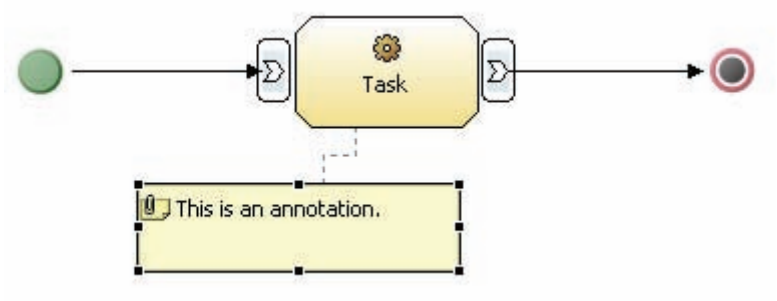

Figure 2. Example of an annotation

In addition to annotations, a description can be added to tasks, decisions, or any other process element. It is recommended that these descriptions contain identical text to that of the annotation attached to it. This is to ensure that a consistent model is developed. Annotations are only to be used to display graphical additional information important to the reader of the business flow. This is especially true if the model is to be printed or viewed outside the Business Modeler application.

Recommendation 7.	An element's description and annotation should have the same text.
Recommendation 8.	Display annotations to enhance user understanding especially when viewed outside Business Modeler.

2.1.6 Global tasks

Tasks within a process model can be either local or global. It is good practice to create tasks as global when a particular task needs to be used over multiple process models. If a local task is created instead of a global one, that local task is only visible in the process model in which it was created.

Recommendation 9.	If a task needs to be used over multiple process models, then that task should be global. Avoid entering two separate local task with the same name.

Global tasks are listed under the '`Process catalogs -> Processes -> Tasks`' section of the process tree. Catalogs should be created under the "`Tasks`" directory, in order to group common tasks.

Recommendation 10.	Common tasks should be grouped into catalogs.

2.1.7 No White Space in Process Model or Artifact Names

When creating resources, business items or other process model artifacts, it is recommended that these artifacts do not contain spaces in their name. This is recommended because models that are eventually converted into Business Process Execution Language (BPEL) output will not recognise items that contain spaces in their name.

If needed, underscores ('_') can be used to separate words. For FLIE, spaces are to be removed and "Camel Case" to be used[3]. For example, 'Movement Process' would be written as 'MovementProcess'.

Recommendation 11.	Ensure process model and artifacts do not have spaces in their names.
Recommendation 12.	FLIE staff should use "Camel Case" formatted names.

2.1.8 Display of Resources and Organisations in Process Models

In process models, attributes such as a resource, can be displayed and assigned to particular elements. It is recommended that all Business Modeler projects used in FLIE should display all organisations and resources within a process model. Displaying these attributes in the diagram allows for easier understanding of the concepts depicted in the process model.

To enable the display of these attributes, select the '`Visual attributes`' tab while a process model is open. When the '`Visual Attributes`' screen is displayed, select '`Labels`' and set the '`Top label`' to '`Individual resource requirements`' and

[3] "Camel Case" is the practice of capitalising the first letter of each word and removing all space, for example the name "Gather External Data" would become "GatherExternalData". This approach is named because of the likeness of the capital letters to that of the humps of a camel.

'`Bottom label`' to '`Organization units`' for '`Global task`'. Refer to Figure 3 and Figure 4 to see example screenshots of the '`Visual Attributes`' screen and the final result.

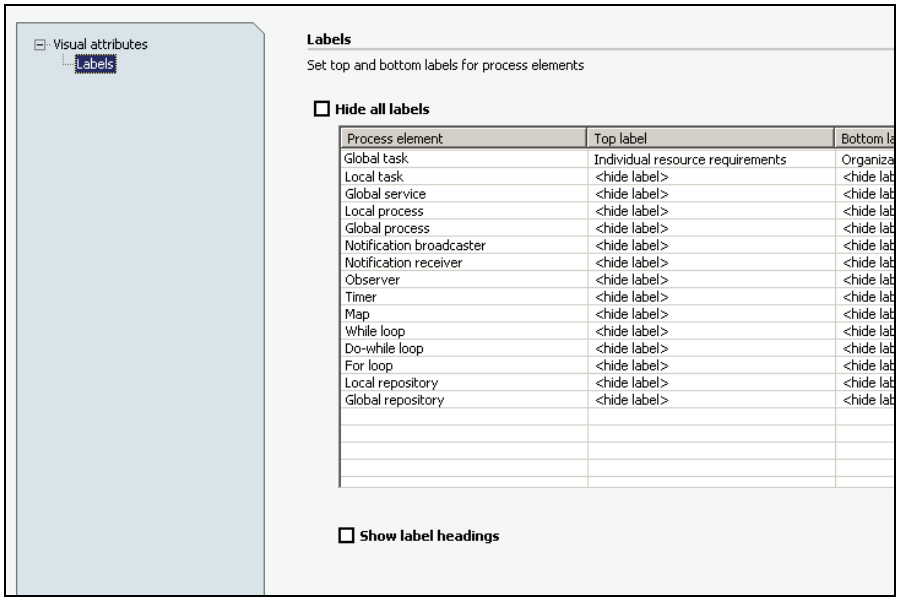

Figure 3. Visual attributes

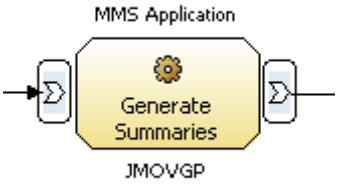

Figure 4. How resources and organisations appear

Recommendation 13.	All global tasks of a process model should display their associated organisation and resource attributes.

2.1.9 Local Processes

Some process models can become quite large and complex. For this reason creating local processes is encouraged as a good habit to develop. It is good practice to group related tasks that occur sequentially into a local process, therefore minimizing the display size of the parent model.

Recommendation 14.	Group sequential, related processes elements as a local process.

2.1.10 Structuring local processes

Local processes are used to group related tasks into one aggregated task, thus reducing the main process model's visible size. There are multiple methods to structure local processes, the method used in FLIE is described below.

1. Add a Local Process element to the process model.
2. Edit the Local Process by selecting the expand button located inside the element itself.
3. Within the Local Process a Start and Stop node are automatically added. The Start and Stop nodes are needed to construct a Local Process properly.
4. Add additional tasks as required to map the Local Process's process flow.

If the Local Process needs to return a business item, then a business item can be passed to the Stop Node and the business item will appear as the output of the Local Process. It is desired to pass the business item to the Stop Node and not the output of the Local Process. If passed to the output of the Local Process, simulation of the process model will not work properly. Refer to Figure 1 below.

Note: there are other ways to structure local processes, but this method is the preferred way.

Recommendation 15.	Always have a start and stop node in a local process.

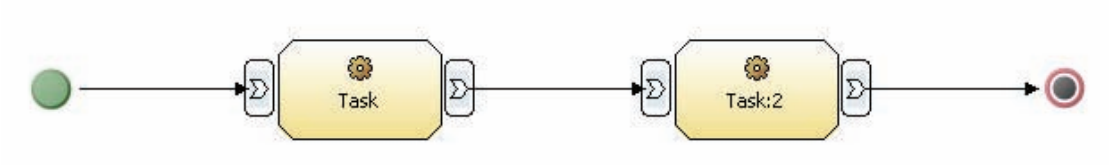

Figure 5. Normal local process

2.2 General Practices

The practices listed above were specific to the work conducted under the DSTO FLIE task. The following sections describe more general practices that should be followed for most other projects. These practices relate mainly to how process models are structured and created.

2.2.1 Use of Merges and Joins

Merges and joins are two components that combine multiple inputs into a single output, but each works in very different ways. A merge waits until one of the inputs arrives, and continues the process using that input (other inputs are ignored). Joins however, waits until all inputs have arrived before continuing along the process path.

Merges are typically used in conjunction with decisions, and are used with all decisions in all our process models for the FLIE task. This is a similar construct to that of a 'switch' statement in programming languages, where based on an input a task is run before

continuing the program's normal procedure. The practice of structuring decisions is described in section 2.2.3 on page 9, which involves using a merge.

Recommendation 16.	Merges should be used to combine after a decisions action is completed.

Joins, as the name suggests, waits until all input has arrived and subsequently combines them into one output. Problems will arise when inputs to a join contain differing business items because an error will be produced. A different structure is needed to work around this and is described in section 2.2.8 on page 13.

2.2.2 Structuring While Loops

There are many approaches to structure a While Loop. As the activity of adding While Loops was not easily understood a description of the method employed is described below as used in the FLIE task.

To start insert a While Loop in a process model, and connect the appropriate elements. Expand the While Loop object by selecting the expand button located within the While Loop graphic. This opens a local process representing the internal loop logic. By default a start node is already added. Create a stop node and add all the elements (tasks, process control, etc.) required to represent the While Loop logic. It is essential that the start and stop nodes are defined within the While Loop, otherwise simulations will fail to execute properly. See Figure 6 below for an example loop process diagram.

Recommendation 17.	Always include a start and stop node within each While Loop.

Figure 6. Internal structure of a while loop

The condition that the While Loop check against as to whether is should continue looping or stop is not specified in the expanded While Loop; instead the condition is defined in the 'Loop Condition' tab. This tab is accessed when the While Loop is selected on the parent process diagram. On this tab an expression or probability can be defined (see Figure 7).

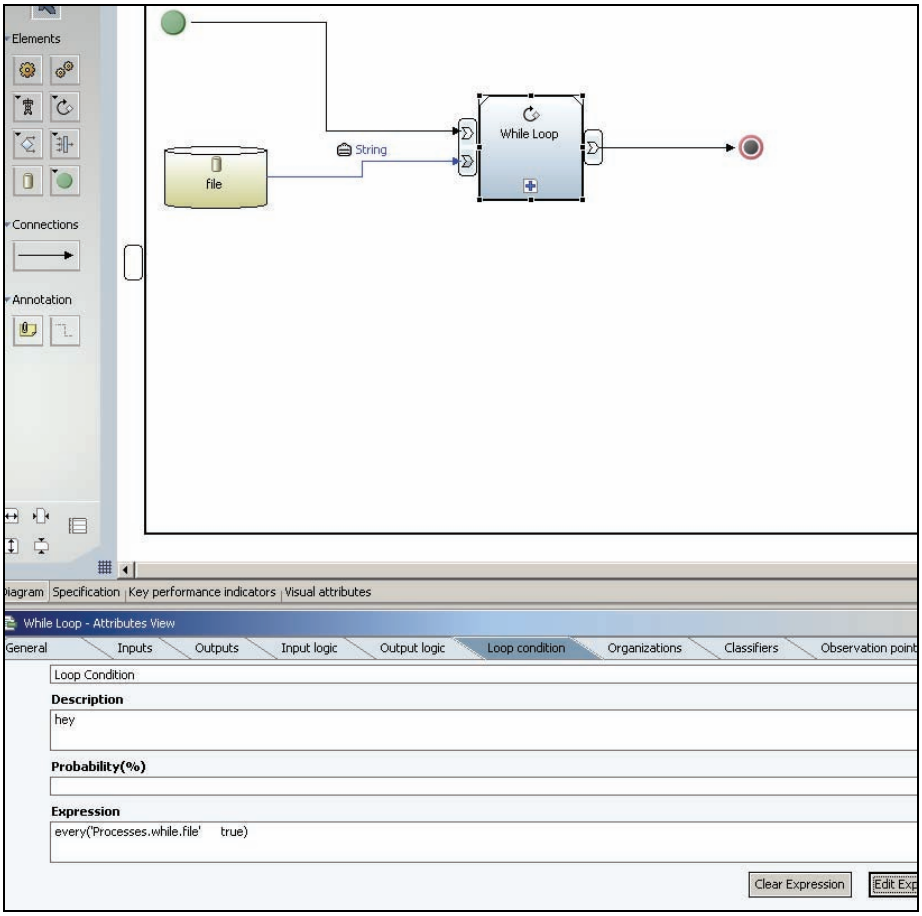

Figure 7. While loop and loop condition

2.2.3 Structuring Decisions

Decisions are elements that Business Modeler uses to describe what programmers usually call 'if statements'. Decisions have two outputs; their selection in a running process is decided by either the evaluation of an expression or by a probability assigned to each output. Described below are the steps used in the FLIE task to create a Decision flow.

1. Insert a decision element into the process model.
2. Specify the tasks to be executed in accordance with the decision.
3. Create a merge element, and merge the two outputs of the decision into it. The merge will wait until an input arrives before continuing execution.
4. The process should look similar to that shown in Figure 8.

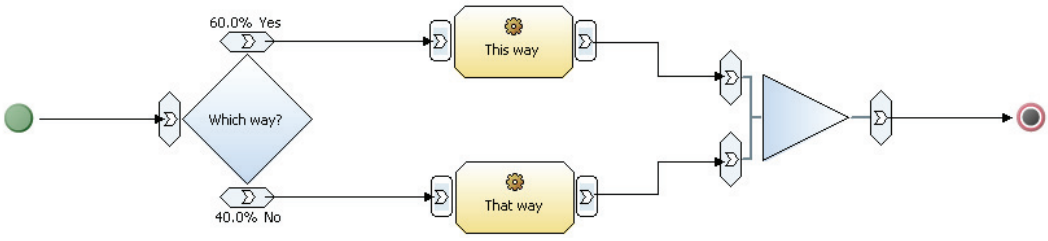

Figure 8. Structuring a decision

As stated earlier, either probabilities or expressions can be specified in a Decision. Condition values are specified by selecting a Decision element and clicking the 'Output Branches' tab. Probabilities are a good approach for decisions that randomly select a path, as opposed to an expression that defines the execution path solely based on its inputs and the evaluated expression.

2.2.4 Using Broadcasters & Receivers

Broadcasters and Receivers work in conjunction and are linked with a Notification. When a Broadcaster is triggered, the associated notification is initiated. This in turn triggers any receivers waiting for that notification message. Process execution restarts with all triggered Receivers. Described below is the procedure to use these components.

1. Create and add a Broadcaster and Receiver to the process model.
2. Create a notification by right clicking 'Data catalogs' from the Project Tree and select 'New'.
3. Drag the new Notification onto both the Broadcaster and Receiver to associate it with each element. This action creates the connection between the Broadcaster and Receiver.
4. Now you have a Broadcaster that sends out a Notification and a Receiver that is initiated when it sees the same Notification.

After a Broadcaster sends a Notification, if the process no longer needs to continue then it is good practice to connect the Broadcaster's output to an End Node (see Figure 9). This ensures processing does not continue beyond the Broadcaster element. However, if the process needs to continue after the notification has been sent, then simply connect other elements to the Broadcaster's output as shown in Figure 11.

Recommendation 18.	If no tasks need executing after a Broadcaster has sent its Notification then connect an end node to the Broadcaster's output.

Once a Receiver catches a Notification the process is once again continued from the Receiver element as shown in Figure 10.

Figure 9. Broadcaster with end node

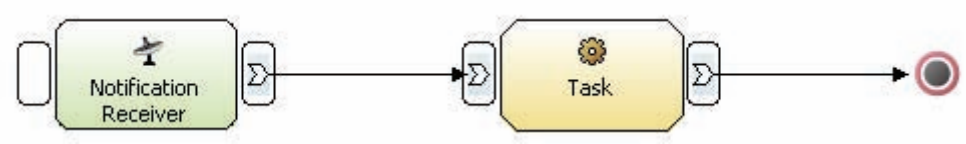

Figure 10. Receiver continues the sequence of execution

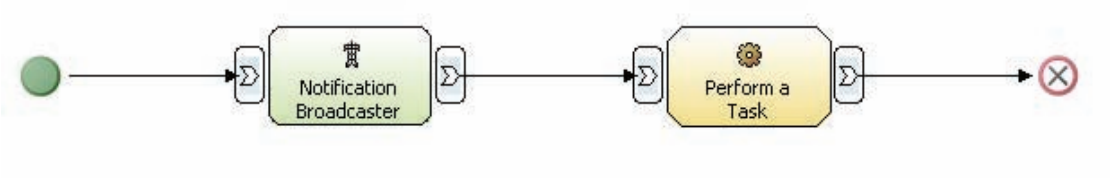

Figure 11. Task performed after broadcaster

2.2.5 Creating Resources, Business Items and Artifacts

The creation of artifacts in a project is accomplished in many ways with varying complexity and detail. In FLIE tasks, the level of detail required is quite high in order to enable accurate simulations. The creation of a Business Item will be used as an example to illustrate the level of detail required.

1. Once a Business Item has been created, double click it from within the '`Project Tree`' to display its attributes.
2. If required select a parent template, otherwise proceed to add attributes to the business item. Each Business Item should be as detailed as possible. For example descriptions, cardinality, uniqueness should be added as an absolute minimum. The example shown in Figure 12 contains a business item named '`Order`' with the attributes '`id`', '`name`', '`seller`', '`date`' and '`items`' added to it.

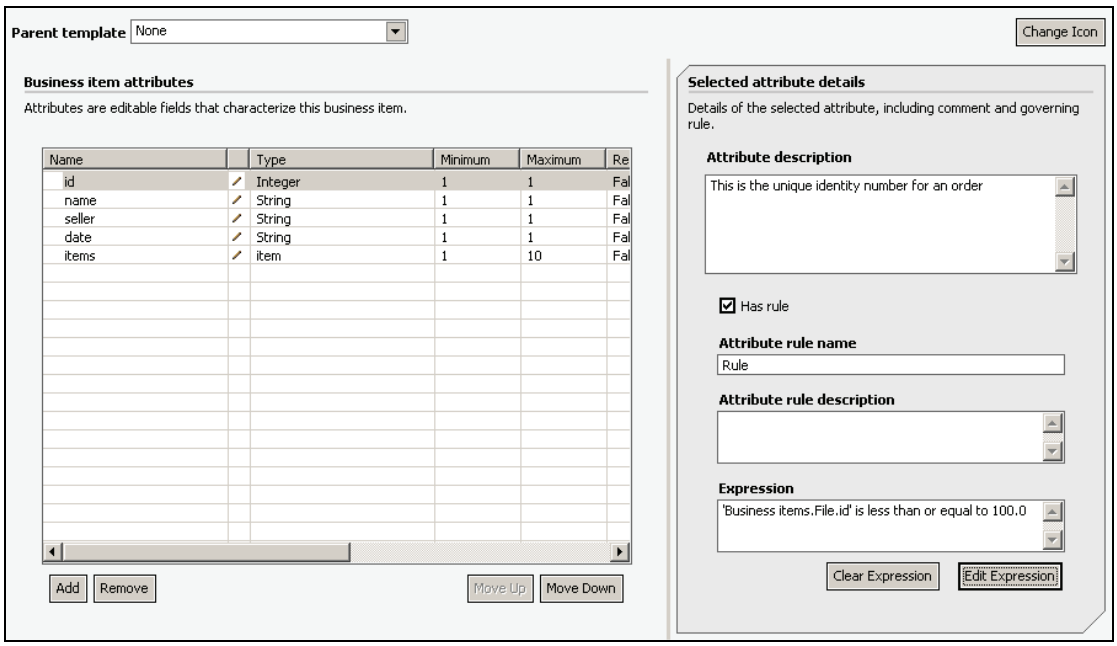

Figure 12. Details for order

Rules can also be applied to attributes. To add rules, select an attribute and select the '`Has Rule`' checkbox. Enter a '`name`', '`description`' and '`expression`' for the attribute.

Recommendation 19.	Add as much detail as possible to all elements.

2.2.6 Using end nodes

An End Node indicates to Business Modeler that a process execution must stop at that particular point. While this is not strictly necessary, it does provide a visual guideline to the Business Modeler user. Figure 13 shows an end node used within a decision construct. This process contains the logic that if a customer is 18, then the order will proceed and the sequence of execution will finish (at the stop node), otherwise the process will end (at the end node). Figure 9 (on page 10) shows another example, where a broadcaster sends a notification and execution ends immediately after sending the notification.

Do not get confused between End Nodes and Stop Nodes. End nodes will halt the process flow at that particular point, but other currently executing flows will continue to work. Stop nodes halt the whole process altogether, and any other currently executing flows will stop as well.

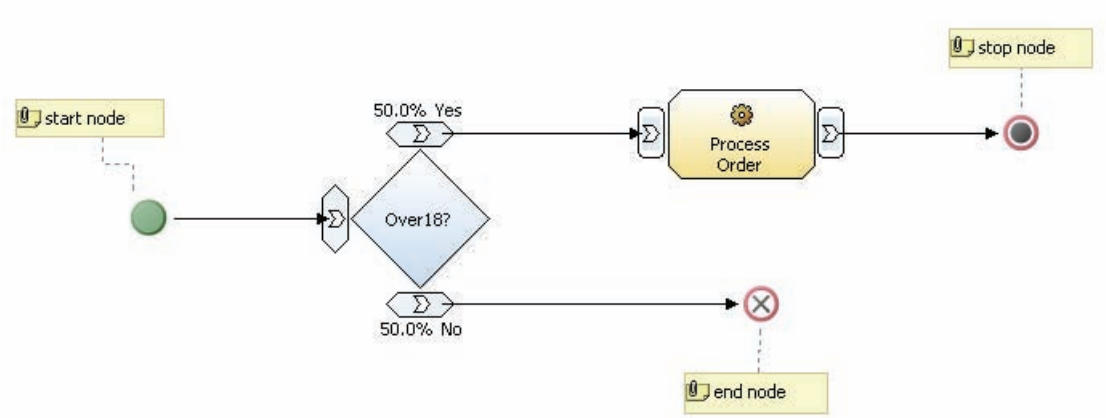

Figure 13. End node in a decision

Recommendation 20.	Always put an end node in a sequence where execution ends.

2.2.7 Structuring Concurrent Processes

Concurrent processes occur when a single input gets split into multiple outputs, and those outputs are concurrently processed by different Activities (see Figure 14). These concurrent processes can continue until the process finishes, or join back together as shown in Figure 14 below.

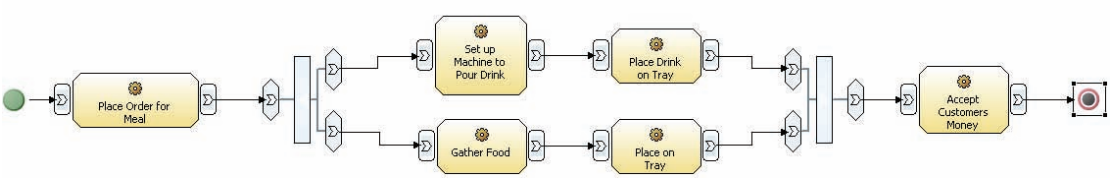

Figure 14. Concurrent processing example

The example above represents the process of purchasing a meal at a fast food restaurant. Once an order is placed, the employee at the check out will set up the drink to be automatically poured, meanwhile another employee collects the remainder of the meal and places it on a tray. Only when both the drink and food are on the tray does the process continue and the customer pays for their food. This example uses a fork to start the concurrent processes and then a join to return to a single process path.

Recommendation 21.	Use forks and joins to model concurrent processes.

2.2.8 Structuring Concurrent Processes with Business Items

There may be situations where multiple outputs need to join back into a single output, but one of those outputs contains differing business items, which means that it cannot be used as a single input. If the conventional method of joining multiple inputs is followed (see section 2.2.7 on page 12), errors will occur because a Join element joins all outputs together, and Business Modeler is expecting these to be of the same type. The solution for this scenario is described below.

Create a similar process model to that in section 2.2.7 (see Figure 14), except that for any output that passes a business item, a second output needs to be created to pass the Business Item onto the task after the Join. For example in Figure 15 only '`Task:2`' outputs a Business Item but this output is different to that of '`Task`' just above, and therefore if their outputs were simply joined then an error would occur. To overcome this an additional output is created on '`Task:2`' and connected to the Join, while the Business Item output is connected to '`Task:3`'. This results in a process that processes '`Task`' and '`Task:2`' concurrently, waits for both to complete with the Join and then executes '`Task:3`' using the business item from '`Task:2`' and the standard output from the join.

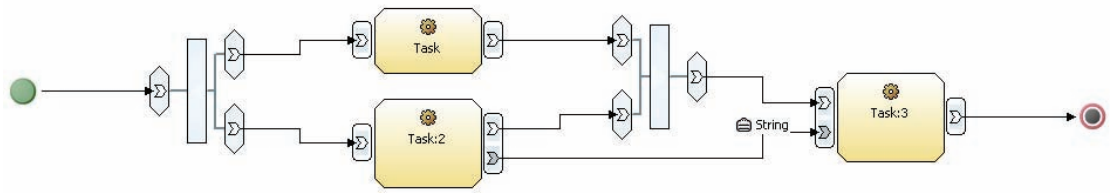

Figure 15. Workaround when business items are involved

This solution is a workaround to enable the simulation to work and is required due to the processing nature of Joins. These types of additional processing structures are required as process models in Business Modeler can actually be exported and executed live against real systems, unlike many other process modeling tools where the output is simply a pretty diagram.

2.2.9 Expressions

Expressions can be added to some process model elements, such as Decisions, While Loops and Observers. These elements evaluate expressions during simulations to determine what outcome should occur. It is strongly encouraged that expressions be assigned wherever possible as this enables process simulations and thus furthers understanding of what is supposed to occur during process execution. It should also be noted that expressions can only be created using Business Modeler's Expression Builder and not by manual keyboard input.

Recommendation 22.	Assign expressions to decisions, while loops and observers wherever possible.

2.2.10 Running Process Simulations

A Process Simulation is a simulation of a process model, This simulation allows users to view how the process performs and responds to varying inputs into the process.. The results of a process simulation details information regarding time durations, costs and resource usage.

It is possible to dynamically change attribute values of Business Items at task output during simulation execution. These dynamic changes can alter the sequence of events in the model and return alternate results allowing for the testing of different scenarios. To make these dynamic changes follow these steps:

1. Start by taking a Simulation Snapshot.
2. Next select a task that outputs a business item and select the '`Business item creation`' tab.
3. Select the appropriate output and click the '`Create simulation values`' button.
4. From this new screen it is possible to change the Business Item's values to be output after the task selected in step 2 above has completed.

3. Summary

These practices and recommendations have been produced to help future IBM Business Integration Modeler Advanced Edition users overcome some of the problems encountered by the FLIE team. More importantly this document has been produced so that future FLIE task members do not have to relearn these lessons. The practices and recommendations documented herein arein no way complete and this document should be read in conjunction with the IBM Quickstart Guide and tutorials to gain a complete appreciation of the product. It is expected that over time as FLIE task members use this software additional practices will be developed; therefore, for the latest version please refer to the DSTO FLIE Sharepoint task page[4]. If you have any comments or additional recommendations, best practices and patterns in the use of Business Modeler please contact Egon Kuster (FLIE task manager, Command and Control Division, DSTO).

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IBM Business Integration Modeler Advanced Edition

Aaron Triantafyllidis and Egon Kuster

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2. TITLE

□Future Logistics Information Environment Best Practices:□IBM Business Integration Modeler Advanced Edition

3. SECURITY CLASSIFICATION (FOR UNCLASSIFIED REPORTS THAT ARE LIMITED RELEASE USE (L) NEXT TO DOCUMENT CLASSIFICATION)

Document	(U)
Title	(U)
Abstract	(U)

4. AUTHOR(S)

Aaron Triantafyllidis and Egon Kuster

5. CORPORATE AUTHOR

DSTO Defence Science and Technology Organisation
PO Box 1500
Edinburgh South Australia 5111 Australia

6a. DSTO NUMBER	6b. AR NUMBER	6c. TYPE OF REPORT	7. DOCUMENT DATE
DSTO-TN-0678	AR-013-580	Technical Note	November 2005

8. FILE NUMBER	9. TASK NUMBER	10. TASK SPONSOR	11. NO. OF PAGES	12. NO. OF REFERENCES
2005/1076568	JTW 04/072	DGSLB	22	4

13. URL on the World Wide Web

http://www.dsto.defence.gov.au/corporate/reports/DSTO-TN-0678.pdf

14. RELEASE AUTHORITY

Chief, Command and Control Division

15. SECONDARY RELEASE STATEMENT OF THIS DOCUMENT

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Logistics Information Systems
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19. ABSTRACT

IBM Business Integration Modeler Advanced Edition allows Future Logistics Information Environment task members to map business processes around existing systems and has been used to map processes surrounding the Movement Management System. During this mapping process a number of lessons were identified and to ensure that these are captured this document has been developed with a series of best practices and recommendation so that these lessons are learnt and future FLIE task members do not suffer the same issues. Although many of the recommendation and practices are tailored to the FLIE task requirements other projects will also benefit.